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ABSTRACT

The proposed methodology was designed to implement the Board of Governor's January 9, 1973, motion regarding the translation of the university's 1973-74 operating budgeting into a program budget showing the resources required by the various university programs and outputs. The methodology defines the main functions of the university in terms of primary programs (instruction, research, and public service) and the activities supportive to them (services to academic community and university administration). The line-item operation budget is assigned to these functions and their outputs. The methodology was tested on a historical data base for 1971-72. Along with a detailed description of the method, this report includes the project time schedule, initiation form, program classification structure, software-to-implement methodology, sample software outputs, a resource requirements prediction model, and budgets. (Author/LBH)

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OFFICE OF INSTITUTIONAL RESEARCH

Project 1138
May 11, 1973

Dr. F. A. Campbell
Vice-President (Academic)
The University of Calgary

Dear Dr. Campbell:

This report sets out in considerable detail a proposed methodology to implement the Board of Governors' January 9, 1973, motion in respect of the translation of the University's 1973/74 operating budget into a program budget showing the resources required by the various University programs and outputs. This methodology will be tested initially on the historical data base for 1971/72. An OIR report presenting results of this test application is expected in the middle of June.

While the proposed methodology is under review by the Academic Policy Committee, we plan to circulate the report to a number of our colleagues in order to get their comments as well.

Yours sincerely,

Bernard S. Sheehan
Director

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METHODOLOGY FOR ACADEMIC PROGRAM ANALYSIS

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Office of Institutional Research
The University of Calgary

May 1973

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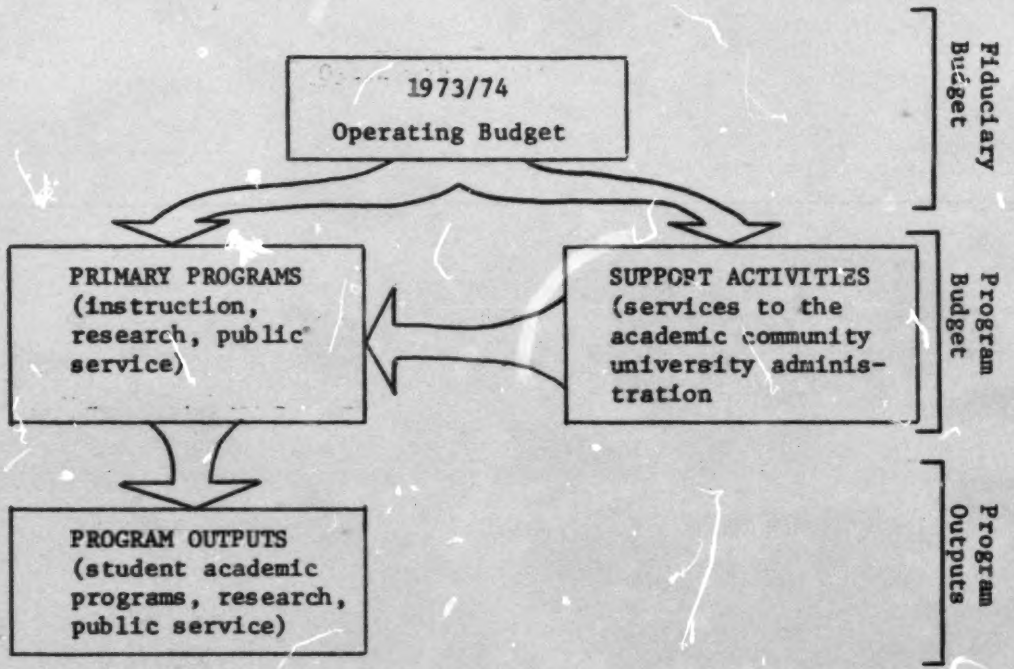
METHODOLOGY FOR ACADEMIC PROGRAM ANALYSIS

Summary

On the request of the Academic Policy Committee, the Office of Institutional Research has developed an approach for translating The University of Calgary 1973/74 operating budget into a program format. This methodology defines the main functions of the university in terms of primary programs (instruction, research and public service) and the activities supportive to them (services to academic community and university administration). The line item operating budget is assigned to these functions and their outputs. The following diagram illustrates these relationships.

ILLUSTRATION OF METHODOLOGICAL RELATIONSHIPS


1973/74
Operating Budget
Fiduciary Budget
PRIMARY PROGRAMS (instruction, research, public service)
SUPPORT ACTIVITIES (services to the academic community university administration
Program Budget
PROGRAM OUTPUTS (student academic programs, research, public service)
Program Outputs

This methodology will be tested on an historical data base 1971/72 and upon its acceptance by the Academic Policy Committee will be applied to the 1973/74 budget data.

Introduction

The Board of Governors passed the following motion at its January 9, 1973 meeting:

> "That the Board of Governors approve the recommendation of the Business and Finance Committee that after determination of the 1973/74 operating budget, the Academic Policy Committee in consultation with the University Budget Committee be requested to review the budgets of the academic units in terms of their programs as distinct from continuing costs and to report thereon to the Board through the Business and Finance Committee."

On the request of the Vice-President (Academic), the Office of Institutional Research initiated a project to assist the Academic Policy Committee in their analysis of academic programs by developing a methodology for translating the resources budgeted for academic units into resources by program. The purpose of this report is to detail progress in developing the methodology to permit the translation of the normal fiduciary budget into a program budget. This methodology is based on the response received from the Vice-President (Academic) to OIR Internal Report 681 "Program Classification Structure Proposal" and OIR Internal Report 701 "Academic Program Analysis: Methodology."

This report defines a framework for the identification of university programs and details a method for assigning the line item budget to these programs and to their outputs. It also includes a description of output that can result from the application of the methodology, an estimate of the time schedule, and a discussion of the software used to implement the methodology.

The methodology described in this report is generalized from the point of view of being applicable to any fiscal year whether it be historical or budgeted. It also is capable of simulating resource requirements for future years as discussed in Appendix C. The methodology will be tested on actual data for 1971/72 prior to its application on budgeted data for 1973/74.

Methodological Assumptions

The methodology developed for this project is based on a number of assumptions with respect to how universities are organized to accomplish their objectives. These assumptions are identified and discussed in the following paragraphs.

Universities are organized in terms of responsibilities in a manner envisioned to be the most viable for the accomplishment of objectives. An organization structure defines the responsibility relationship amongst organizational units (departments, faculties, committees) that collectively participate in the pursuit and accomplishment of objectives (*Assumption 1*).

The financial measurements of resources needed by the university to accomplish its purposes are classified by the accounting system. The relationship between the accounting system and the organizational structure is defined by budget units (*Assumption 2*). Subclassifications of resource categories within each budget unit are called line items.

Budget units are allocated funds for the procurement of resources. Each budget unit normally has one spending authority (budget unit officer) resident in an organizational unit. Based on organizational responsibilities each budget officer employs the funds of budget units to acquire resources to sustain activities. Thus budget units are classifications of the financial measures of resources used to support activities (*Assumption 3*).

University goals and objectives are accomplished by output producing activities (*Assumption 4*). Due to the difficulty in identifying and measuring university outputs, proxies or indicators of output must be selected. Thus in analysis, university outputs are modeled by output proxies which have the capability of being identified and measured. Given this definition output proxies are simply sets of activities. For example, student degree programs are output proxies for instruction. Quantitative descriptions of activities (or sets of activities) are called proxy measures. For example, proxy measures of a student academic program may be the costs, or the weekly student hours, or the professor's time, or the space associated with the courses (activities) which make up the student academic program. *The purpose for which an analysis is undertaken determines the proxy measure and the set of activities which produce the output proxy (Assumption 5).*

Overview of Methodology

The methodological approach to this analysis of academic programs is summarized by three phases defined below. Each of these phases is briefly discussed and diagrammatically summarized in Figure 1. A more detailed discussion of the methodology is presented later in this report.

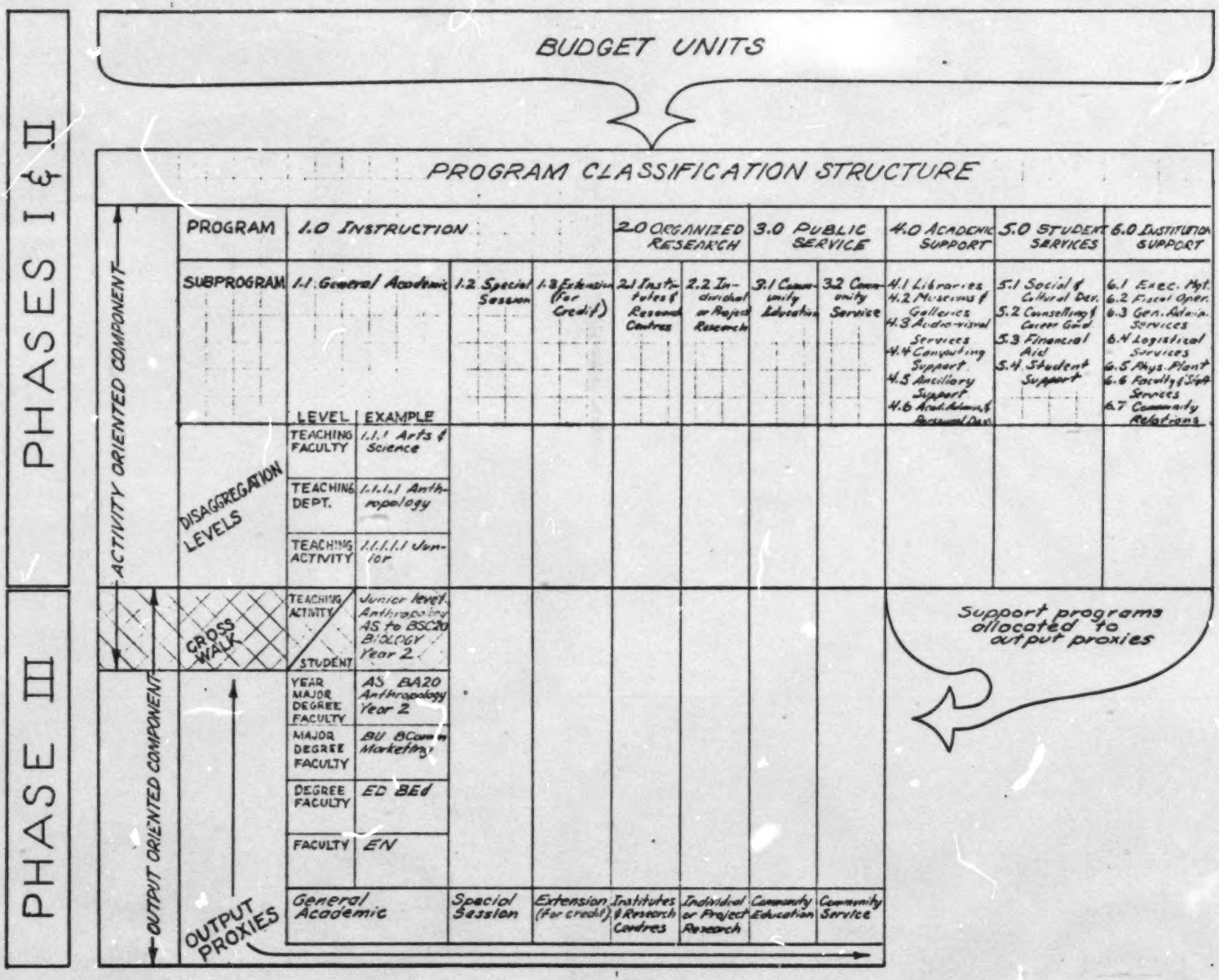
Phase I: Framework for Program Analysis

Budget units undertake activities in support of university programs. This phase defines a set of university programs and identifies for each budget unit the programs to which they contribute.

A Program Classification Structure (PCS) is a classification of university activities. Normally, university activities are classified according to their intended function resulting in an "activity" oriented structure or around an acceptable system of output proxies resulting in an "output" oriented structure. This methodology defines a Program Classification Structure that has both an activity oriented and output oriented component. Phase I of the methodology defines the activity oriented component--the classification of university activities according to their intended function. This component has three major divisions.

Figure 1

OVERVIEW of METHODOLOGY



OIR 95
5/73

1. Program -- The major functions of a university are called programs. These functions are differentiated into primary programs and support programs.[1] Primary programs are those that contribute directly to the role of the university. Support programs are those that are adjunct or in direct support of the primary programs.

2. Subprogram -- Subprograms are subdivisions of programs based on subobjectives of each program.

3. Disaggregation levels -- The activities undertaken in support of each subprogram are classified in terms of a number of levels where each level is capable of being separately managed or controlled. The number of such levels is dependent upon management information needs.

The programs, subprograms and disaggregation levels are illustrated in Figure 1. Definitions for each of the programs and subprograms are contained in Appendix B, Program Classification: Definitions of Programs and Subprograms. The contribution each budget unit makes to the programs and subprograms is determined based on these definitions.

Phase II: Program Resource Synthesis

Programs are sustained by resource allocations. This phase assigns resources to university programs by relating the resources of each budget unit to the activities undertaken by them.

The resources of budget units are assigned to programs and subprograms based on the contributions defined in Phase I. For purposes of this analysis, the assignment will be concerned with total academic salaries (E1), total support salaries (E2), total supplies and other expenses (E3), net operating expenses (E1 + E2 + E3), and academic FTE only.

Phase III: Output Synthesis

University output proxies are measured in terms of resources that

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[1]The identification of primary and support programs tends to be stable over time. However, the definition of the relationships the support activities (programs) have to the primary programs tends to be unstable. While internal pricing systems facilitate this process it is still largely a matter of judgment as to how support programs do serve primary programs. The purpose of the decision-maker, for whom analysis is undertaken, should be the criteria that guides the definition of this relationship. For example, Academic Policy Committee in undertaking a review of academic programs may be concerned on one hand with the contribution the library makes to each of the primary programs and on the other hand with the contribution all the support activities make to instruction disciplines. In an effort to provide the decision-maker with flexibility in terms of relating support activities to primary programs allowance has been made for the separate identification of support programs.

sustain program activities that produce outputs. This phase selects relevant output proxies for each university primary program and relates resources to them.

Output proxies represent the output oriented component of the Program Classification Structure. Output proxies are indicators of program outputs defined as a set of activities. The identification of output proxies is unstable and is dependent upon the purpose for which one wishes to use given proxies. The output proxies selected for the evaluation of academic programs by the Academic Policy Committee are illustrated in Figure 1. It is important to note that only primary programs are defined to have output proxies since it is the activities of the primary programs that result in output that directly contribute to the accomplishment of university goals and objectives. Support programs *assist* primary programs in accomplishing university objectives and therefore do not have outputs of their own.

Associated with each component and each subdivision of each component of our approach are "program measures." These are quantitative descriptors that characterize the program for management purposes in terms of resources assigned or utilized, groups or clients served, expenditures incurred, revenues generated, etc.

Description of Output

Application of the proposed methodology results in measures that characterize the outputs of university programs in terms of resources. Flexibility inherent in the methodology permits a wide range within which output proxies of the programs may be described and their resources measured. Figure 2 defines the constraints of this flexibility by delimiting these descriptors and measures.

The methodology focuses its analysis on the primary subprogram General Academic Instruction (PCS 1.1). While this concentration has been selected due to the magnitude of this subprogram it does not preclude further analysis on the remaining primary programs and subprograms. For purposes of this analysis these programs and subprograms are analyzed at their highest level of aggregation.

Figure 3 defines and illustrates possible sample output formats for the primary subprogram General Academic Instruction (PCS 1.1). This figure aggregates both output proxy descriptors and measures into a manageable level of detail. For example, student majors in Arts and Science are grouped into divisions of Natural Sciences, Social Sciences and Humanities. Due to the limited analysis the methodology performs on the remaining primary programs and subprograms, a great deal of flexibility for reporting formats is not possible in these areas.

Appendix D: Software Output Formats illustrates sample data produced by the software. The results produced by the software used in the

methodology may have to be reorganized to provide data in desired formats. For example, Figure 1, Appendix D would be reorganized to provide results in the format illustrated in Figure 3.

Figure 2

OUTPUT PROXY DESCRIPTORS AND MEASURES

PRIMARY PROGRAMS AND SUBPROGRAMS	OUTPUT PROXY DESCRIPTORS[1]	OUTPUT PROXY MEASURES
1.0 Instruction		
1.1 General Academic Instruction	Faculty of Registration (Business, Education, etc.) Degree Sought (BSC 15, BA 20, BCOMM, etc.) Major (Biology, Geology, Music) Registration Status (full-time or part-time) Student level (year of studies)	Direct Resources: Academic FTE Academic Salaries (E1) Support Salaries (E2) Supplies and Other Expenses (E3) Indirect Resources: Net operating expenses (E1 + E2 + E3) by support subprograms
1.2 Special Session Instruction	Special Session Instruction	Same as General Academic Instruction (PCS 1.1)
1.3 Extension Instruction	Extension Instruction	"
2.0 Research		
2.1 Institutes and Research Centres	Institutes and Research Centres	"
2.2 Individual or Project Research	Individual or Project Research	"
3.0 Public Service		
3.1 Community Education	Community Education	"
3.2 Community Service	Community Service	"

[1] Output proxies for all programs and subprograms other than General Academic Instruction (PCS 1.1) are analyzed at their highest level of aggregation.

Figure 3

SAMPLE OUTPUT FORMAT

OUTPUT PROXY DESCRIPTORS					OUTPUT PROXY MEASURES									
					RESOURCES UTILIZED						RESOURCES UTILIZED PER STUDENT			
FACULTY	DEGREE	MAJOR	FULL/PART	LEVEL	ACADEMIC FTE	DIRECT PRIMARY OPERATING AMOUNT	DIRECT PRIMARY OPERATING PERCENT	INDIRECT SUPPORT OPERATING	TOTAL OPERATING AMOUNT	TOTAL OPERATING PERCENT	ACADEMIC FTE	DIRECT OPERATING	TOTAL OPERATING	NUMBER OF STUDENTS
AS	BA	SS	F	UPPER	56	$ 812*	.05	$312*	$1124*	.04	.13	$1845	$2554	440
AS	BSC	NS	F	UPPER	93	1488*	.09	893*	2381*	.10	.15	2439	3903	610
BU	BCOMM	BUS	F	UPPER	25	380*	.03	320*	700*	.03	.04	558	1030	690
BU	BS	NURS	P	LOWER	0.25	5*	.01	2*	7*	.01	.06	1755	1630	4
GS	EDUC	EDUC	P	MSTR	1.1	16*	.01	14*	30*	.01	.06	804	1523	20
GS	ENGG	ENGG	F	UDOC	12.2	292*	.02	128*	419*	.03	.19	4418	6357	66
					A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q

(A) FACULTY refers to the faculty of student registration.

(B) DEGREE refers to degree sought. While flexibility is available to permit resource analysis for every valid degree per the Master Student File, it is proposed that logical groupings be made to reduce the number of output proxies. For example BA 15, 1A 15A, BA 20, BA 20A, BA 20H can be grouped into BA. Similarly, BCOMM SPC, BCOMM,-(no major), BCOMM, can be grouped into BCOMM.

(C) MAJOR refers to student major. Similar grouping as in DEGREE is proposed. For example majors in Arts and Science can be grouped into division--Humanities, Social Sciences, Natural Sciences.

(D) FULL/PART refers to registration status of student (full-time or part-time).

(E) LEVEL refers to student year. It is proposed that first year be lower level, second, third and fourth year be grouped as upper level, etc.

(F) ACADEMIC FTE refers to actual full-time equivalent academic fte staff of the primary subprogram General Academic Instruction (per Universities Commission UC-O-11 form as at December 1) generated by output proxy.

(G) AMOUNT refers to dollar cost of direct operating expenses of primary subprogram General Academic Instruction incurred by the output proxy.

(H) DIRECT PRIMARY OPERATING refers to net operating expenditures incurred by the primary subprogram General Academic Instruction.

(I) PERCENT refers to percent the dollar cost incurred by the output proxy is of the total direct operating cost of the primary subprogram General Academic Instruction.

(J) INDIRECT SUPPORT OPERATING refers to the dollar cost of the support programs and subprograms that have been allocated to the output proxy.

(K) AMOUNT refers to the sum of G and J.

(L) TOTAL OPERATING refers to the sum of H and J.

(M) PERCENT refers to the percent the dollar cost incurred by the output proxy is of the total direct and indirect operating cost of the primary subprogram General Academic Instruction.

(N) ACADEMIC FTE refers to F ÷ Q.

(O) DIRECT OPERATING refers to G ÷ Q.

(P) TOTAL OPERATING REFERS TO K ÷ Q.

(Q) NUMBER OF STUDENTS refers to number of students in defined output proxy.

*Thousands of dollars

Detailed Methodology: Historical Test Application

The Board action is concerned with translating the 1973/74 operating budget into a program budget format. The methodology of this project initially will be applied on a historical basis for the fiscal year 1971/72. Proceeding in this manner has a number of advantages. It allows the use of actual rather than estimated input data (much of the actual data is available from The University of Calgary Cost Study) and hence provides a better approximation of reality. It facilitates future application of the methodology by providing a basis for extrapolating. It permits the Office of Institutional Research to respond to the request of the Academic Policy Committee in a time frame much shorter than is required to respond in a projection mode. It provides Academic Policy Committee with an opportunity to review the appropriateness of the methodology and the results obtained from its application vis-à-vis their review of academic programs. It also provides Academic Policy Committee with a basis for comparing future applications.

This section of the report details the methodology used in the historical test application. It defines the major methodological processes involved in each phase, as described in the Overview of Methodology, and identifies their inputs and outputs. Figure 4 diagrammatically illustrates the interrelationships among the constituent processes and related inputs and outputs of the three phases.

Phase I -- Step 1: Identify University Programs

Definitions of university programs and subprograms selected for this analysis are contained in Appendix B, Program Classification Structure: Definitions of Programs and Subprograms. This component (activity oriented) of the program classification structure selected for the project is closely modelled after the one developed by the National Center for Higher Education Management Systems (NCHEMS) Western Interstate Commission on Higher Education (WICHE). This results in substantial time and costs savings in that it permits us to use software developed by NCHEMS at WICHE.[1]

Some of the more important assumptions inherent in the definitions of Appendix B are identified and discussed below. Firstly, those activities of faculty members, often called "departmental research," which includes preparation of materials on future courses, publishing, faculty research, and other activities related to the professional responsibilities of faculty are included in the instruction program rather than in the research program.

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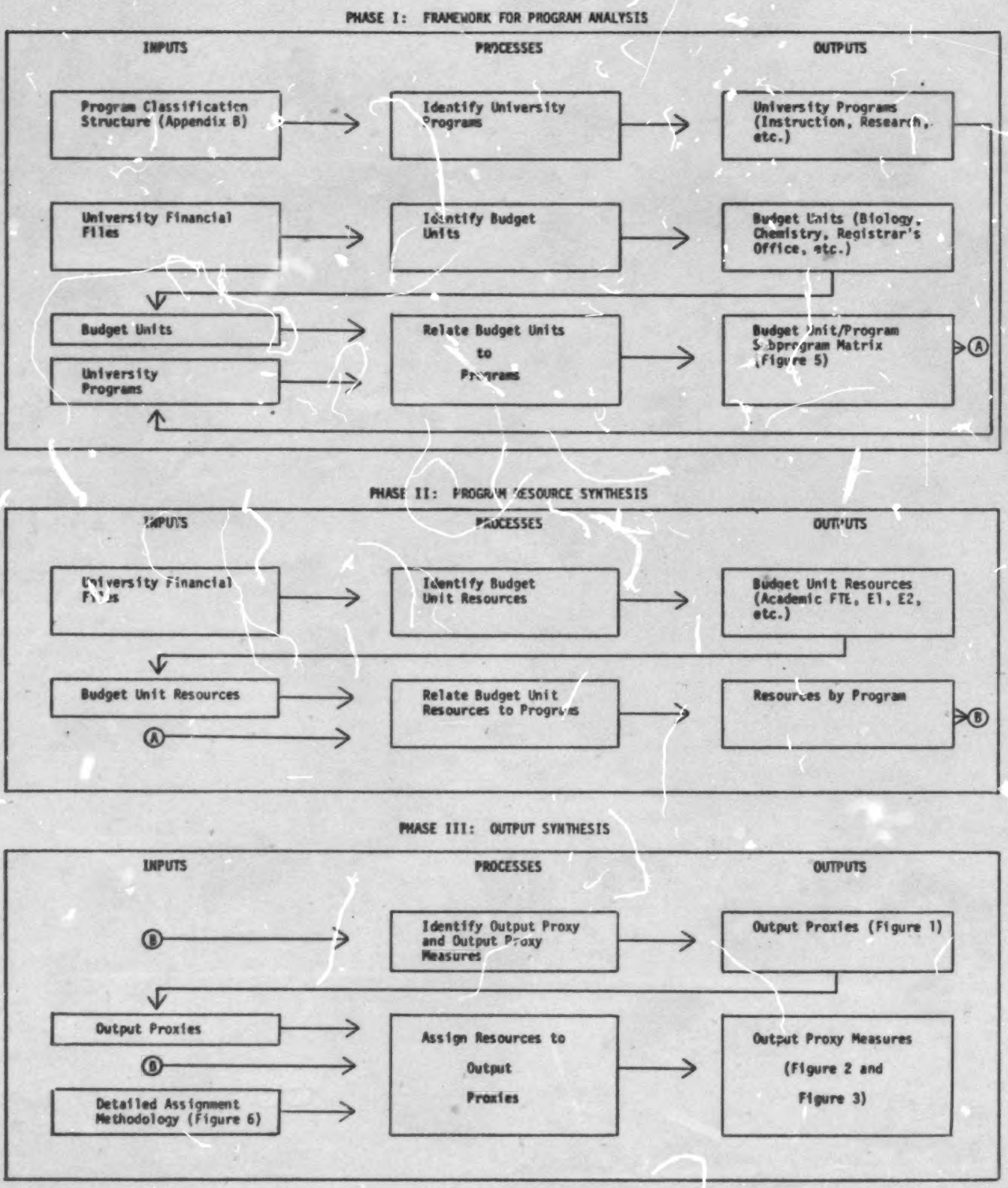
[1] The NCHEMS at WICHE has expended considerable time and effort in designing and developing systems for planning and management of higher education. Use of their software permits the Board's directive (to translate 1973/74 budgets of academic units into program resources) to be implemented in a reasonable time. Modification of this software to suit specific needs of The University of Calgary may eventually prove desirable.

Figure 4

INPUTS AND OUTPUTS OF MAJOR METHODOLOGICAL PROCESSES



Similarly professional activities often referred to as "public service" are also included in the Instruction Program. While it is recognized that departmental research can contribute to the Instruction and Research programs and public service can contribute to the Instruction and Public Service programs, the measurement of these diverse contributions depends upon how broadly or narrowly one defines these programs. The point of view taken in this analysis is the same as that of NCHEMS at WICHE who define these activities in a very broad sense to belong to the same class of activities as teaching, and since the purpose of a program budget is to relate resources to programs and output proxies rather than to analyze the activities of faculty, these activities are not separately categorized.[1]

Another assumption inherent in the program classification structure relates to the administrative activities undertaken by faculty in support of the department, the faculty, or the university. Since these activities would normally be related to output proxies in a manner similar to the instruction program they have been included in this program.

Phase I -- Step 2: Identify Budget Units

The identification of budget units is obtained from the university's financial files. While all budget units are identified for any given year, they are not all analyzed in the same level of detail.[2]

The detail with which a given budget unit is analyzed depends on the programs or subprograms to which it contributes. Budget units contributing to the programs and subprograms other than General Academic Instruction (PCS 1.1) are analyzed at their highest level of aggregation. For example, the assignment of the President's Office to Executive Management (PCS 6.1) does not proceed any further since this subprogram is not disaggregated into levels of executive management. Budget units contributing to the subprogram General Academic Instruction (PCS 1.1) are analyzed in terms of instruction levels and graduate supervision (Appendix B). The only exceptions to this are Medicine and Environmental Design. Data is not available to permit a detailed analysis; hence they are analyzed at their highest level of aggregation.

Phase I -- Step 3: Relate Budget Units to Programs

The definition of the relationship between budget units and

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[1] Warren K. Gulko, Program Classification Structure, Technical Report 13 (Preliminary Edition for Review) [Boulder, Colorado: Western Interstate Commission on Higher Education, June 1970.]

[2] For purposes of analysis the budget units within the Faculty of Business (Dean's Office, Administration Science, Business Operations, Organizational Environment) are grouped into one. Similarly, the four teaching departments (Civil, Chemical, Electrical, Mechanical) are grouped into one unit.

university programs and subprograms is defined in Figure 5. The contribution each budget unit makes to the subprogram General Academic Instruction (PCS 1) is further defined in terms of instruction levels and graduate supervision.

Phase II -- Step 1: Identify Budget Unit Resources

This methodology is concerned with assigning operating resources only to programs and output proxies. These resources are total academic salaries (E1), total support salaries (E2), total supplies and other expenses (E3), net operating expenses (E1 + E2 + E3), and total academic FTE. The output proxies for each of the primary programs and subprograms will be measured in terms of academic salaries, support salaries and supplies and other expenses. The output proxies of the primary subprogram General Academic Instruction (PCS 1.1) will be additionally measured in terms of academic FTE. The assignment of support programs to output proxies will be measured in terms of net operating expenses (E1 + E2 + E3). While capital costs are not included in this analysis, they may be incorporated into the methodology at a later time.

Phase II -- Step 2: Relate Budget Unit Resources to Programs

Operating resources are related to program activities based on Figure 5. The following explanatory comments further define this assignment where an organizational budget unit is assumed to participate in more than one program or subprogram.

a) The contribution to the support subprogram Academic Administration and Personnel Development (PCS 4.6) from Faculties and Schools budget units includes academic salaries of faculty on leave only.

b) The contribution to the support subprogram Financial Aid (PCS 5.3) from Graduate Studies includes funds from the following supplies and other expenses categories: graduate research assistants, graduate service assistants, intersession bursaries (summer assistantships), remission of fees and dissertation fellowships.

c) The contribution to the support subprogram Social and Cultural Development (PCS 5.1) from the School of Physical Education includes academic salaries, support salaries and supplies and other expenses spent in support of general university athletics. This breakout is based on time distribution data from the Faculty Annual Report to the President.

d) In faculties such as Nursing, Social Welfare and Physical Education, where the administrative component is difficult to isolate (not separately budgeted), these activities are included in the subprogram General Academic

Figure 5

BUDGET UNIT/PROGRAM AND SUBPROGRAM MATRIX

BUDGET UNIT	1.0 INSTRUCTION: 1.1 General Academic Instruction	1.2 Special Session Instruction	1.3 Extension Instruction (for credit)	2.0 ORGANIZED RESEARCH: 2.1 Institutes & Research Centers	2.2 Individual or Project Research	3.0 PUBLIC SERVICE: 3.1 Continuing Education	3.2 Community Service	4.0 ACADEMIC SUPPORT: 4.1 Libraries	4.2 Museums & Galleries	4.3 Audio/Visual Services	4.4 Computing Support	4.5 Ancillary Support	4.6 Academic Admin. & Personnel Development	5.0 STUDENT SERVICES: 5.1 Social & Cultural Development	5.2 Counselling & Career Guidance	5.3 Financial Aid	5.4 Student Support	6.0 INSTITUTIONAL SUPPORT: 6.1 Executive Management	6.2 Fiscal Operations	6.3 General Admin. Services	6.4 Logistical Services	6.5 Physical Plant Operations	6.6 Faculty and Staff Services	6.7 Community Relations
Dean's Office AS	X												X											
Interdisciplinary Studies AS	X												X											
Archaeology	X												X											
Biology	X												X											
Chemistry	X												X											
Classics	X												X											
Economics	X												X											
English	X												X											
Geography	X												X											
Geology	X												X											
Germanic & Slavic Studies	X												X											
History	X												X											
Linguistics	X												X											
Mathematics	X												X											
Philosophy	X												X											
Physics	X												X											
Political Science	X												X											
Psychology	X												X											
Romance Studies	X												X											
Sociology & Anthropology	X												X											
Dean's Office--Business	X												X											
Administrative Science	X												X											
Business Operations	X												X											
Organizational Environment	X												X											
Dean's Office--Education	X												X											
Curriculum & Instruction	X												X											
Educational Administration	X												X											
Educational Foundations	X												X											
Educational Psychology	X												X											
Student Teaching												X	X											
Computer Applications												X	X											
Learning Technology Unit												X	X											
University Elementary School												X	X											
Dean's Office--Fine Arts	X												X											
Interdisciplinary Studies FA	X												X											
Art	X												X											
Drama	X												X											
Music	X												X											
Dean's Office--Engineering	X												X											
Engineering Common Program	X												X											
Chemical Engineering	X												X											
Civil Engineering	X												X											
Electrical Engineering	X												X											
Mechanical Engineering	X												X											
IDC Faculty Services												X	X											
Graduate Studies	X												X			X								
Medicine	X												X											
Nursing	X												X											
Physical Education	X												X	X										
School of Social Welfare	X												X											
Environmental Design	X												X											
Evening Credit Program			X																					
Summer Session		X																						
Communications Media Services										X														
C.A.R.E.T.							X																	
Computing Services											X													
Research Fund Contributions					X																			
Stenographic Services																					X			
Staff Travel													X											
Technical Services AS												X												

Figure 5

BUDGET UNIT/PROGRAM AND SUBPROGRAM MATRIX (Continued)

| BUDGET UNIT | PROGRAMS AND SUBPROGRAMS | | |

Instruction (PCS 1.1). In an effort to be consistent, separately funded administrative units within the faculties and schools (Dean's Office--Arts & Science, Interdisciplinary Studies--Arts & Science, Dean's Office--Education, Dean's Office--Fine Arts, Interdisciplinary Studies--Fine Arts, Dean's Office--Engineering, Common Program--Engineering, Graduate Studies), are also assumed to be part of the subprogram General Academic Instruction (PCS 1.1). The associated operating resources from each faculty are allocated to its constituent teaching departments, instruction levels, and graduate supervision based on academic salaries. Graduate Studies operating resources are allocated to all teaching departments and graduate supervision based on the number of full-time and part-time graduate students in each department.

Phase III -- Step 1: Identify Output Proxies and Output Proxy Measures

Output proxies and output proxy measures are defined in Figures 2 and 3. Output proxies of the subprogram General Academic Instruction (PCS 1.1) will be described in terms of faculty, degree, major, full or part-time status and level of studies. Certain logical grouping of degrees and majors will be made to facilitate digestion of the results. These groupings can be easily modified. Output proxies of all other primary programs and subprograms will be described at their highest level of aggregation.

Phase III -- Step 2: Assign Resources to Output Proxies

This step of the methodology allocates resources of programs and subprograms to output proxies of primary programs. Support programs are allocated to primary programs and/or directly to output proxies (Figure 1). Figure 6 summarizes the detailed methodology of this assignment. This figure identifies the program or subprogram from which resources are allocated (ALLOCATION SOURCE), the resources that are allocated (ALLOCATION COMMODITY), the program or subprogram to which resources are allocated (ALLOCATION RECIPIENT) and the basis of allocating the resources from one program or subprogram to another (ALLOCATION BASIS).

Detailed Methodology: 1973/74 Budget Application

To apply the methodology on a projected basis requires several additional inputs. The more important of these are identified and discussed below.

a) To assign resources to university programs and to measure output proxies in terms of these resources requires estimates of budget unit resource requirements. These estimates are available for the fiscal year 1973/74 from the operating budget.

Figure 6

ASSIGNMENT OF PROGRAM RESOURCES TO OUTPUT PROXIES

STEP NO.	ALLOCATION SOURCE	ALLOCATION COMMODITY	ALLOCATION RECIPIENT	ALLOCATION BASIS	COMMENTS
1.	General Academic Instruction (PCS1.1)	Academic Salaries (E1)	Instruction levels and graduate supervision	Time distribution data from Faculty Annual Report to the President	Where time distribution data is not available academic salaries are allocated per average department time distribution data.
2.	"	Support salaries (E2)	"	Allocated E1 per Step 1	
3.	"	Supplies and sundries (E3)	"	Allocated E1 per Step 1	
4.	Instruction levels allocation per Step 1	Academic salaries (E1)	Output proxies (student academic programs)	Weekly student hours (WSH) by student academic program per ICLM	Cost per WSH determined for each department and instruction level.
5.	Instruction levels allocation per Step 2	Support salaries (E2)	"	"	"
6.	Instruction levels allocation per Step 3	Supplies and sundries (E3)	"	"	"
7.	Graduate supervision allocation per Step 1	Academic salaries (E1)	Output proxies (graduate student academic programs)	Headcount of graduate students by department	Full-time and part-time students assigned equal weighting.
8.	Graduate supervision allocation per Step 2	Support salaries (E2)	"	"	"
9.	Graduate supervision allocation per Step 3	Supplies and sundries (E3)	"	"	"
10.	Special Session Instruction (PCS1.2)	Academic salaries (E1)	Output proxies (Special Session Instruction)	Academic salaries (E1)	Output proxies are defined at their highest level of aggregation (sum of activities contributing to subprogram).
11.	"	Support salaries (E2)	"	"	"
12.	"	Supplies and sundries (E3)	"	"	"
13.	Extension Instruction (PCS1.3)	Academic salaries (E1)	Output proxies (Extension Instruction)	"	"
14.	"	Support salaries (E2)	"	"	"
15.	"	Supplies and sundries (E3)	"	"	"
16.	Institutes and Research Centres (PCS2.1)	Academic salaries (E1)	Output proxies (Institute and Research Centres)	"	"
17.	"	Support salaries (E2)	"	"	"
18.	"	Supplies and sundries (E3)	"	"	"
19.	Continuing Education (PCS3.1)	Academic salaries (E1)	Output proxies (Continuing Education)	"	"
20.	"	Support salaries (E2)	"	"	"
21.	"	Supplies and sundries (E3)	"	"	"
22.	Community Service (PCS3.2)	Academic salaries (E1)	Output proxies (Community Service)	"	"
23.	"	Support salaries (E2)	"	"	"
24.	"	Supplies and sundries (E3)	"	"	"
25.	Libraries (PCS4.1)	Sum E1, E2 and E3	Subprograms of primary program Instruction (PCS1.0)	Academic salaries (E1)	
26.	Libraries allocation per Step 25	Sum E1, E2 and E3	Output proxies (Primary Program Instruction)	For instruction levels of PCS1.1 by WSH by student academic program per ICLM	
				For graduate supervision of PCS1.1 by department student headcount	Full-time and part-time students assigned equal weighting.
				Academic salaries (E1) for PCS1.2 and 1.3	
27.	Museums and Galleries (PCS4.2)	Sum E1, E2 and E3	Output proxies (Community Service)	Sum E1, E2 and E3	Output proxies are defined at their highest level of aggregation (sum of activities contributing to subprogram).

Figure 6

ASSIGNMENT OF PROGRAM RESOURCES TO OUTPUT PROXIES (Continued)

STEP NO.	ALLOCATION SOURCE	ALLOCATION COMMODITY	ALLOCATION RECIPIENT	ALLOCATION BASIS	COMMENTS
28.	Audio Visual Services (PCS4.3)	Sum E1, E2 and E3	Primary program Instruction (PCS1.0) by subprogram, discipline and instruction level	To subprogram per academic salaries (E1) To discipline per usage and instruction level per academic salaries	
29.	Audio Visual allocation per Step 28	Sum E1, E2 and E3	Output proxies (Primary program Instruction)	Same as Step 26	
30.	Computing Support (PCS4.4)	Sum E1, E2 and E3	Subprograms of primary programs	Academic salaries (E1)	
31.	Computing Support allocation per Step 30	Sum E1, E2 and E3	Output proxies (primary programs)	Headcount for PCS1.1 Academic salaries for PCS1.2, 1.3, 2.1. 2.2, 3.1, 3.2	
32.	Ancillary Support (PCS4.5)	Sum E1, E2 and E3	Primary subprogram General Academic Instruction (PCS1.1) by discipline and instruction level or graduate supervision	Academic salaries (E1)	Ancillary support of each faculty is allocated only to disciplines within that faculty.
33.	Ancillary Support allocation of Step 32	Sum E1, E2 and E3	Output proxies (General Academic Instruction)	Instruction levels within each faculty by WSH by student academic program per ICLM	
				Graduate supervision within each faculty by student headcount	Full-time and part-time students assigned equal weighting.
34.	Academic Administration and Personnel Development (PCS4.6)	Sum E1, E2 and E3	Subprograms of primary programs	Academic salaries (E1)	
35.	Academic Administration and Personnel Development allocation of Step 34	Sum E1, E2 and E3	Output proxies (primary programs)	Student headcount for PCS1.1 Academic salaries for PCS1.2, 1.3, 2.1, 2.2, 3.1, 3.2	Output proxies are defined at their highest level of aggregation (sum of activities contributing to subprogram).
36.	Social and Cultural Development (PCS5.1)	Sum E1, E2 and E3	Subprograms of primary program Instruction (PCS1.0)	Academic salaries (E1)	
37.	Social and Cultural Development allocation per Step 36	Sum E1, E2 and E3	Output proxies (Primary program Instruction)	Headcount for PCS1.1 Academic salaries for PCS1.2, 1.3	Output proxies are defined at their highest level of aggregation (sum of activities contributing to subprogram).
38.	Counselling and Career Guidance (PCS5.2)	---	---	---	Same as Steps 36 and 37.
39.	Financial Aid (PCS5.3)	Subset of E3 from Graduate Studies	Output proxies (graduate student academic programs of General Academic Instruction)	Student headcount	Full-time students only.
40.	Student Support (PCS5.4)	---	---	---	Same as Steps 36 and 37.
41.	Executive Management (PCS6.1)	---	---	---	Same as Steps 30 and 31.
42.	Fiscal Operations (PCS6.2)	---	---	---	"
43.	General Administrative Services (PCS6.3)	---	---	---	"
44.	Logistical Services (PCS6.4)	---	---	---	"
45.	Physical Plant (PCS6.5)	---	---	---	"
46.	Faculty and Staff (PCS6.6)	---	---	---	"
47.	Community Relations (PCS6.7)	---	---	---	"
48.	General Academic Instruction (PCS1.1)	Academic FTE	Instruction levels and graduate supervision	Same as Step 1	
49.	Instruction Levels allocation per Step 48	Academic FTE	Output proxies (student academic programs)	Same as Step 4	
50.	Graduate Supervision allocation per Step 48	Academic FTE	Output proxies (graduate student academic programs)	Same as Step 7	

b) A basis for distributing resources of teaching departments to instructional levels and graduate supervision is required. While time distribution data is gathered historically for purposes of The University of Calgary Cost Study, they are not available for future years. Alternative approaches must be investigated for making this assignment.

c) The assignment of program resources to output proxies requires estimates of the number of output proxies expected to be produced. For example, enrolment projections are required if an estimation is to be made of their resource utilization.

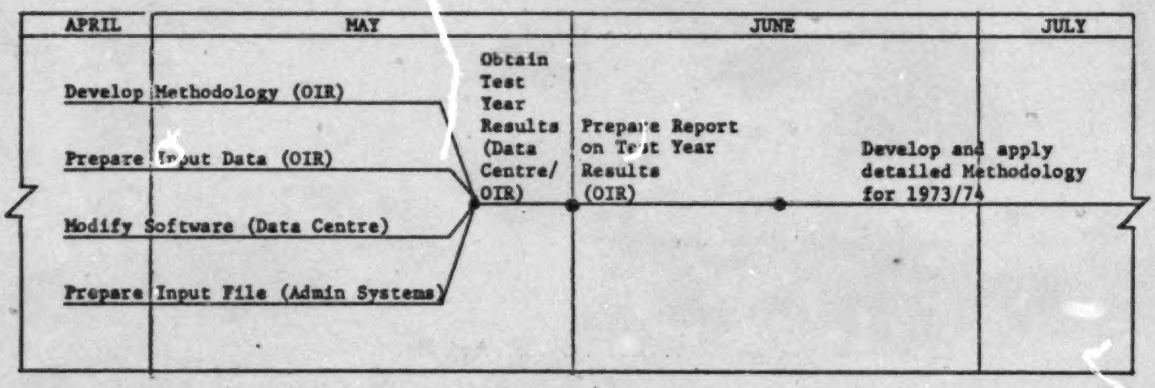
d) A distribution of the work load student academic programs generate in departments is required. The Induced Course Load Matrix (ICLM) of the historical test application, as discussed in Appendix C must be modified for 1973/74 enrolment projections.

Time Schedule

The primary purpose of this report is to define a methodology for implementing the Board of Governor's directive to translate the 1973/74 operating budget into program terms and to define its detailed application for the 1971/72 test year. Figure 7 defines the time schedule within which it is expected to complete the historical test year application. Results for 1971/72 are expected on May 31, 1973 and an OIR report documenting these results and seeking final approval of the methodology so that we can proceed with its detailed development and application to 1973/74 budget data is expected in the middle of June. This figure also summarizes the interdepartmental relationship in terms of the input required from each to complete the present analysis.

Figure 7

TIME SCHEDULE



APPENDIX A

PROJECT INITIATION FORM

APPENDIX A

The University of Calgary
Office of Institutional Research

PROJECT INITIATION FORM

Date: January 31, 1973

Project No.: 1138

Initiation Date: January 29, 1973

Completion Date (est.): May, 1973 ++

Requested by: F. Campbell (V.P. Academic)

Primary User(s): Academic Policy Committee and Board of Governors

Project Officer: M.G. Michaels

Project Title: ACADEMIC PROGRAM ANALYSIS

Project Description: This project will assist the Academic Policy Committee by developing a methodology that relates the line-item budget to the resources needed for university programs so that resource requirements of these programs can be evaluated. The methodology will have the following elements:

1. Define and identify university programs.
2. Develop a matrix that will enable the line-item budget to be distributed to the university programs. (This is a "cross-walk" between the normal fiduciary line-item budget and a program budget.)
3. Present the university program budget in terms of program resource requirements.

It is suggested that 1971-72 be the test year for developments, as it is the most recent year for which we have complete statistical data.

This is an interdisciplinary project and will require contributions from each analyst and assistant analysts.

Director Approval: Bernard A. Beckham Date: Jan 31/73

OIR 95
5/73

APPENDIX B

PROGRAM CLASSIFICATION STRUCTURE

APPENDIX B

PROGRAM CLASSIFICATION STRUCTURE[1]

1.0 Instruction Program (Primary)

The instruction program consists of all formal educational activities in which a student engages to earn credit toward a degree or certificate at the university. Those program elements that have been established to provide additional opportunities for learning, but are not creditable toward degrees and certificates, should be assigned to the student service program (6.0) if the primary intent is to provide supplemental or remedial educational services for matriculated students, or to the public service program (3.0) if the primary intent is to offer teaching services for members of the community.

1.1 General academic instruction -- is those instructional program elements operating during the academic year that are part of a formal degree or certificate curriculum and are managed by the regular academic departments.

1.1.1 - 1.1.n Teaching Faculty (1.1.1 Arts & Science, 1.1.2 Business, 1.1.3 Education, etc.)

1.1.1.1 - 1.1.1.n Teaching Department (1.1.1.1 Anthropology, 1.1.1.2 Biology, 1.1.3.2 Educational Administration, etc.)

1.1.1.1.1 - 1.1.1.1.n Teaching Activity (1.1.1.1.1 Junior instruction, 1.1.1.1.2 Senior instruction, 1.1.1.1.3 Graduate instruction, 1.1.1.1.4 Graduate Supervision.)

1.2 Special session instruction --includes instruction program elements that offer credit toward a formal degree or certificate and are in operation during a summer session, interim session or other period that is not in common with the regular term.

1.3 Extension instruction (for credit) -- includes all instructional program elements that are managed separately by the Extension Division and are applicable toward a formal degree or certificate. Excluded from this subprogram are those extension program elements or similar activities that may not be credited toward formal degrees or certificates and are offered primarily as a public service, e.g., continuing education, short courses, etc.

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[1]The program classification structure in the proposal is modeled after that developed by the National Center for Higher Education Management Systems at WICHE but related closely to The University of Calgary requirements.

2.0 Organized Research Program (Primary)

The organized research program comprises all research-related program elements established under the terms of agreement with agencies external to the university or separately budgeted and conducted with internal funds.

2.1 Institutes and research centres -- contains all research-related program elements that are part of a formal research organization. Typically, research organizations are created to manage a number of research efforts. Program elements belonging to such semi-autonomous entities should be included within this program.

2.2 Individual or project research -- contains the research program elements that are normally managed within the academic departments. This subprogram consists of the various research-related program elements that have been created as a result of a contract, grant, or specific allocation of university resources to conduct a study or investigation with the principal investigator. Program elements within this subprogram are normally created for a specified period of time as contrasted to the more permanent nature of the research organizations within the institutes and research centres subprogram.

It should be noted that academic faculty engage frequently in a variety of activities that contribute to their professional development. Such faculty activities are commonly referred to as "departmental research," which includes academic resources employed in such endeavors as faculty research, publication activity, preparation of materials for future courses, and other activities related to the professional responsibilities of faculty. These activities are included in the Instruction Program rather than in the Research Program.

3.0 Public Service Program (Primary)

The public service program contains the program elements within the university that produce outcomes directed toward the benefit of the community or individuals residing within the geographic service area of the university.

3.1 Community education -- contains the program elements that are managed by the Division of Continuing Education to provide noncredit instructional services to members of the community.

3.2 Community service -- is those program elements that have been established to provide general community services, excluding instructional activities. Community service program elements are managed within the university and have been established to provide general public services to the community at large or special sectors within the community. Community service is concerned with making available to the public various resources and unique capabilities that exist within the university.

Professional development activities of faculty commonly referred to as "public service" are included under the Instruction Program similar to departmental research.

4.0 Academic Support Program (Support)

The academic support program contains those program elements that support the primary programs through the retention, preservation, and display of materials or provide services that directly assist the academic functions of the university.

4.1 Libraries -- consists of all activities that directly support the operation of a catalogued or otherwise classified collection of published material in a central facility.

4.2 Museums and galleries -- includes all program elements established to provide services related to the collection, preservations, and exhibition of historical materials, art objects, scientific displays, etc.

4,3 Audio/visual services -- is all program elements associated with providing audio and/or visual materials or media services to support the primary programs. Program elements are normally organizational units established to provide audio/visual service to a particular sector of the university.

4.4 Computing support -- contains those program elements that have been established to provide computing support to the primary programs.

4.5 Ancillary support -- is program elements that provide support services to the primary programs and are not appropriately classified within the previous subprograms. Such ancillary support activities, when they exist, normally provide joint services to the instruction, organized research, and public service programs such as technical services, animal care services, and demonstration schools.

4.6 Academic administration and personnel development -- contains the program elements related to personnel development such as the commitment of resources for sabbaticals, and university staff travel.

5.0 Student Service Program (Support)

The student service program comprises all program elements related to the university's student body, excluding the degree-related activities and student records.

5.1 Social and cultural development -- is those program elements that have been established to provide for the student's social and cultural development outside of the degree curriculum such as intercollegiate athletics.

5.2 Counselling and career guidance -- contains program elements established to provide counselling services, career guidance and placement services to the student body.

5.3 Financial aid -- consists of program elements established to provide financial services and assistance to students.

5.4 Student support -- contains elements established within the university to provide convenience services to the student body or services to special student groups such as Health Services, Off-Campus Housing and Bookstore.

6.0 University Support Program (Support)

The university support program consists of those activities within the university that provide campuswide support to the other programs.

6.1 Executive management -- consists of all central executive level program elements and other program elements concerned with the management and long range planning of the entire university, as contrasted to any one program within the university. Included within this subprogram are such central operations as legal services and executive direction, which consists of the governing board, the chief executive officer, and the senior executive officers. Planning and programming are those central operations related to the management and planning for the university, including analytical studies, institutional research, long range planning, etc.

6.2 Fiscal operations -- includes those central operations related to fiscal control, investments, and functional program elements related to the fiscal operations of the university.

6.3 General administrative services -- includes program elements that provide central administrative services to the university support program (e.g. Administrative Systems) and functional program elements related to student records and staff personnel.

6.4 Logistical services -- contains program elements that provide procurement services, supply and maintenance of provisions, and the orderly movement of support materials for the campus operation. Included within logistical services are central program elements related to the environmental health and safety of the staff and students.

6.5 Physical plant operations -- are those program elements established to provide services related to the campus grounds and facilities.

6.6 Faculty and staff services -- includes the program elements established to provide support services for the faculty and staff.

6.7 Community relations -- are those program elements that have been established to maintain relationships with the general community, alumni, or other constituents, and to conduct activities related to development and fund raising.

APPENDIX C

SOFTWARE TO IMPLEMENT METHODOLOGY

APPENDIX C

SOFTWARE TO IMPLEMENT METHODOLOGY

Introduction

The approach developed for translating operating resources into program formats combines software developed by NCHEMS at WICHE and The University of Calgary in a unique application for accomplishing particular steps of the methodology. The purpose of this appendix is to describe this application of the software and to discuss some of the alternatives considered.

The methodology has the three following components:

1. Define a set of university programs and identify for each budget unit the programs to which they contribute (Phase I: Framework for Program Analysis).

2. Assign resources to university programs by relating the resources of each budget unit to the activities undertaken by each of them (Phase II: Program Resource Synthesis).

3. Select relevant output proxies for each university primary program and relate program resources to them (Phase III: Output Synthesis).

Historical Test Application

The identification of the contribution each budget unit makes to the programs and subprograms of the Program Classification Structure (Phase I) is assisted by The University of Calgary Cost Study software.[1] While the assignment of all nonteaching budget units is based on a judgmental assessment of their program contributions, the time distributions from the Faculty Annual Report to the President are used for the assignment of teaching budget units. With the assistance of software developed for the Cost Study individual faculty members' time distributions are averaged by department (budget unit) and rank.

The assignment of budget unit resources to university programs and subprograms (Phase II) is based on the program contribution indicators developed in Phase I. This allocation is performed with the assistance of The University of Calgary Cost Study software. Manual efforts assign these resources to programs, subprograms and disciplines and Cost Study software

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[1] Office of Institutional Research, The University of Calgary Cost Study 1971/72, Report 89 (The University of Calgary, January 1973).

assigns these resources to their further disaggregation levels.

"Cost Finding Principles"[1] software developed by NCHEMS could be used as an alternative to The University of Calgary Cost Study software. It has the facility for translating line items from The University of Calgary financial files to programs via a crossover that allows allocations based on input percentages. It also allocates support program resources to primary programs, primary subprograms, disciplines and course levels.

Phase III relates the program resources to their output proxies. The Resource Requirements Prediction Model 1.6[2] is implemented to satisfy this need. The ICLM Generator[3] developed by NCHEMS to aid in data preparation for RRPM 1.6 is used to provide statistical data that defines the relationship between the work load of students and the work load of departments (disciplines) in the subprogram General Academic Instruction (PCS 1.1). The generator is adapted to The University of Calgary student and course files to calculate the average number of weekly student hours generated by a student in any one output proxy category in each of the disciplines by course level. This data becomes input for RRPM 1.6.

RRPM 1.6 is a long range planning model designed for assisting in the management of higher education. It estimates resource requirements of university programs and subprograms and assists in assigning these resources to output proxies of the instruction program (PCS 1.0).

Since faculty resources are known for analysis of historical years, all information to activate that part of the RRPM software which assists in translating program resources into resources of output proxies (ICLM) is available. However, in an effort to avoid time consuming modifications

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[1]George Beatty Jr., Cost Finding Principles: Software Documentation, (Preliminary Draft for Review Purposes only), [Boulder, Colorado: National Center for Higher Education Management Systems at Western Interstate Commission for Higher Education, February 1973.]

[2]William J. Collard and Michael J. Haight, The Resource Requirements Prediction Model 1.6: System Documentation, (Boulder, Colorado: National Center for Education Research and Development, Division of Research and Development Resources at Western Interstate Commission for Higher Education, December 1972.)

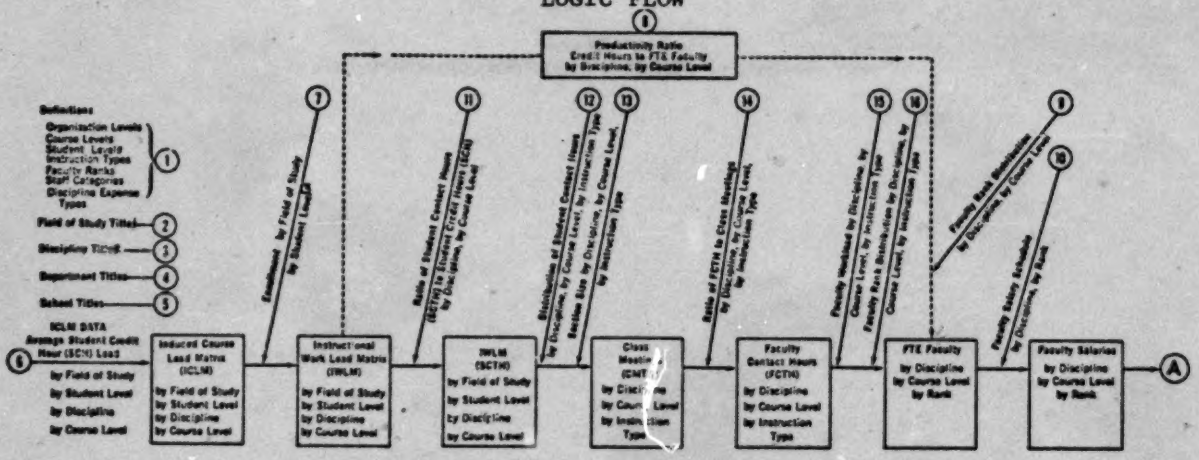
[3]Michael J. Haight and Charles W. Manning, Induced Course Load Matrix Generator, System Documentation, (Boulder, Colorado: National Center for Higher Education Management Systems at Western Interstate Commission for Higher Education, August 1972.)

to the software to permit implementation of RRPM 1.6 at this point, it was decided to activate the estimating capability using the "short method" of the two estimating algorithms of the model. This provides an efficient facility for input of desired program resources for assignment to output proxies. Since budget data is available for 1973/74, this method can also be used to translate these resources into resources by program and output proxy.

Figure 1 illustrates the "short method" by (1) - (10). Student enrolments and their course loads (i.e. weekly student hours as generated by the ICLM) are translated into faculty resource requirements based on a ratio called the productivity ratio (i.e. WSH/FTE). The FTE generated are multiplied by average faculty salaries by rank to yield total academic salaries. Ratios of support FTE to academic FTE are combined with average support salaries to yield total support staff salaries by discipline. Supplies and other expenses per FTE academic are also input to yield total supplies and other expenses by discipline. Resources of support programs are input as constants by discipline and course level.

Figure 1

RESOURCE REQUIREMENTS PREDICTION MODEL 1.6
LOGIC FLOW


Productivity Ratio
Credit Hours to FTE Faculty
by Discipline, by Course Level
Definitions
Organization Levels
Course Levels
Student Levels
Instruction Types
Faculty Ranks
Staff Categories
Discipline Expense Types
Field of Study Titles
Discipline Titles
Department Titles
School Titles
ICLM DATA
Average Student Credit Hour (SCH) Load
by Field of Study
by Student Level
by Discipline
by Course Level
Induced Course Load Matrix (ICLM)
by Field of Study
by Student Level
by Discipline
by Course Level
Enrollment by Field of Study by Student Level
Instructional Work Load Matrix (IWLM)
by Field of Study
by Student Level
by Discipline
by Course Level
Ratio of Student Contact Hours (SCTH) to Student Credit Hours (SCH) by Discipline, by Course Level
IWLM (SCTH)
by Field of Study
by Student Level
by Discipline
by Course Level
Distribution of Student Contact Hours by Discipline, by Course Level, by Instruction Type
Section Size by Discipline, by Course Level, by Instruction Type
Class Meeting (CMT)
by Discipline
by Course Level
by Instruction Type
Ratio of FCTH to Class Meetings by Discipline, by Course Level, by Instruction Type
Faculty Contact Hours (FCTH)
by Discipline
by Course Level
by Instruction Type
Faculty Workload by Discipline, by Course Level, by Instruction Type
Faculty Rank Distribution by Discipline, by Course Level, by Instruction Type
FTE Faculty
by Discipline
by Course Level
by Rank
Faculty Rank Distribution by Discipline, by Course Level
Faculty Salary Schedule by Discipline, by Rank
Faculty Salaries
by Discipline
by Course Level
by Rank

SOURCE: David G. Clark, et al, Introduction to the Resource Requirements Prediction Model 1.6 Technical Report 34A, (Boulder, Colorado: National Center for Higher Education Management Systems at Western Interstate Commission on Higher Education, 1973).

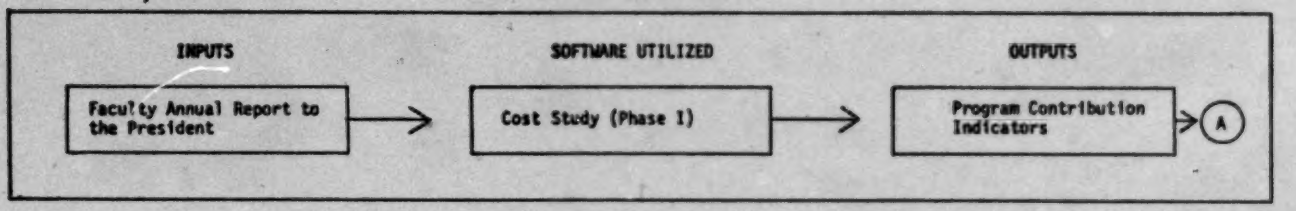
At this point, resources in the discipline and course level resource centres equal those generated at the end of Phase II of the methodology. The RRPM 1.6 model is used to transfer these resources to output proxies. Resources per weekly student hour by discipline and course level are calculated and carried back through the ICLM in order to yield the resources per output proxy category.

Figure 2 shows a conceptualization of the software adopted for the historical test application of the methodology.

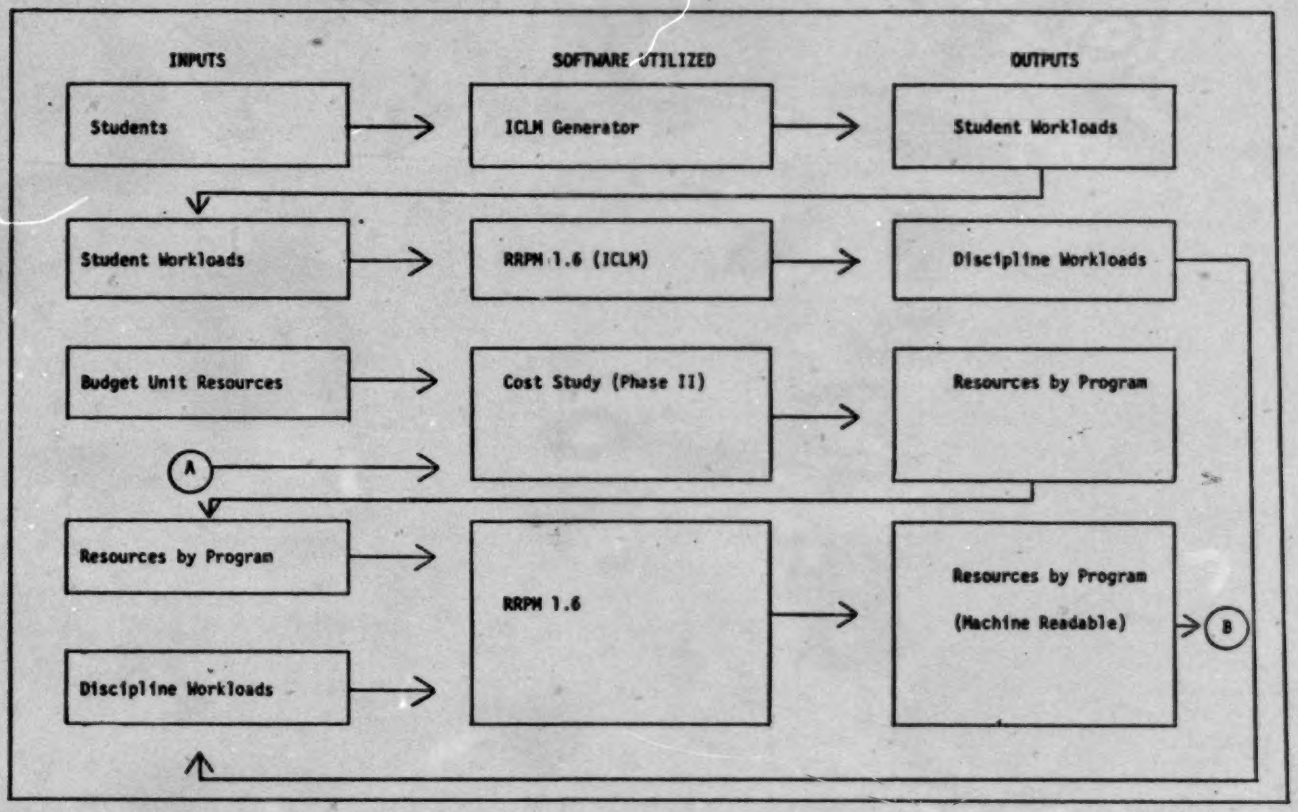
Figure 2

HISTORICAL TEST APPLICATION: SOFTWARE ADOPTED

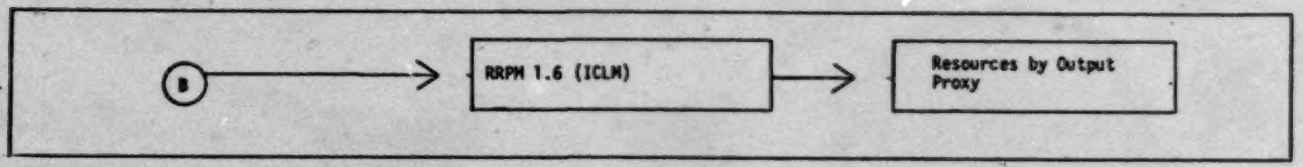
PHASE I: FRAMEWORK FOR PROGRAM ANALYSIS



PHASE II: PROGRAM RESOURCE SYNTHESIS



PHASE III: OUTPUT SYNTHESIS



1973/74 Budget Application

Implementation of the methodology for the 1973/74 budget will be identical to that of the historical test application. The only difference between the two applications is that the values for the parameters used to drive the software will be budgeted or estimated 1973/74 data.

Application Beyond 1973/74

Analysis of academic programs beyond 1973/74 requires software with a capacity to estimate program resources as well as assign those resources to output proxies. The "long method" of RRPM 1.6, as diagrammed in Figure 1, (1) - (16), provides this tool. The "long method" translates student enrolments and course load into faculty resource requirements by program on the basis of an algorithm similar to the model discussed in OIR Report 90, "Experience with Planning Models in the University Budgeting Process."

Basic inputs to the "long method" of the RRPM 1.6 model include the induced course load matrix (ICLM) as provided by the ICLM generator. This shows how budget units provide instructional services to students in different output proxy categories. Projected student enrolments by output proxy category are combined with the ICLM to determine projected total weekly student hours by discipline and course level (IWLM). Percentage distributions are input to divide these weekly student hours in instruction types. Average section size by discipline, course level and instruction type is applied to the weekly student hours to generate weekly section hours. Ratios to translate average class size into average section size may be input into the model at this point, however, simultaneous instruction at The University of Calgary is handled in the data base for most departments so this facility will not normally be used. Average faculty work load is applied to the generated section hours to estimate academic FTE requirements. Average faculty salaries by rank are combined with these FTE requirements to yield total estimated academic salaries. Methods of determining support staff salaries and supplies and other expenses are similar to those in the "short method." Support program resources are estimated by RRPM 1.6 using generalized estimating equations.

APPENDIX D

SAMPLE SOFTWARE OUTPUTS

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Figure 1

RRPM 1.6 OUTPUT: PROGRAM BUDGET

ITER = (DD) DEFAULT DATA
BASE = (**)

PICAD UNIVERSITY II
RESOURCE REQUIREMENTS PREDICTION MODEL

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PROGRAM BUDGET						COST PER STUDENT		
INSTRUCTIONAL PROGRAM (BY STUDENT LEVEL)		COST PER STUDENT	NUMBER OF STUDENTS	PERCENT PROGRAM STUDENTS	PERCENT TOTAL STUDENTS	PROGRAM COST	PERCENT PROGRAM BUDGET	PERCENT INSTR BUDGET
(0001)	HISTORY							
(LD)	LOWER DIVISION	910.92	74.00	39.57	5.54	67,408.08	32.20	3.74
(UD)	UPPER DIVISION	1,144.93	87.00	46.52	6.51	99,608.91	47.58	5.53
(GD)	GRAD DIVISION	1,628.00	26.00	13.90	1.95	42,328.00	20.22	2.35
(**)	WTD. AVG./TOTALS	1,119.49	187.00	100.00	14.00	209,344.99	100.00	11.63
(0002)	ENGLISH							
(LD)	LOWER DIVISION	900.65	58.00	36.71	4.34	52,237.70	29.70	2.90
(UD)	UPPER DIVISION	1,106.33	77.00	48.73	5.76	85,185.41	48.44	4.73
(GD)	GRAD DIVISION	1,471.53	23.00	14.56	1.72	38,445.19	21.86	2.14
(**)	WTD. AVG./TOTALS	1,113.10	158.00	100.00	11.83	175,870.30	100.00	9.77
(0003)	BIOLOGY							
(LD)	LOWER DIVISION	1,191.67	42.00	39.62	3.14	50,050.14	23.53	2.78
(UD)	UPPER DIVISION	2,072.45	48.00	45.28	3.59	99,477.60	46.77	5.53
(GD)	GRAD DIVISION	3,947.98	16.00	15.09	1.20	63,167.68	29.70	3.51
(**)	WTD. AVG./TOTALS	2,006.56	106.00	100.00	7.93	212,695.42	100.00	11.82
(0004)	CHEMISTRY							
(LD)	LOWER DIVISION	1,175.80	32.00	45.07	2.40	37,625.60	27.85	2.09
(UD)	UPPER DIVISION	2,499.06	39.00	54.93	2.92	97,463.34	72.15	5.41
(**)	WTD. AVG./TOTALS	1,902.66	71.00	100.00	5.31	135,088.94	100.00	7.50
(0005)	PHYSICS							
(LD)	LOWER DIVISION	1,233.97	21.00	52.50	1.57	25,913.37	33.87	1.44
(UD)	UPPER DIVISION	2,663.14	19.00	47.50	1.42	50,599.66	66.13	2.81
(**)	WTD. AVG./TOTALS	1,912.83	40.00	100.00	2.99	76,513.03	100.00	4.25

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THE UNIVERSITY OF CALGARY

Figure 2

APPENDIX D

RRPM 1.6 OUTPUT: ORGANIZATIONAL BUDGET

ITEM = (DD) DEFAULT DATA
BASE = (**)

MICRO UNIVERSITY II
RESOURCE REQUIREMENTS PREDICTION MODEL

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ORGANIZATIONAL BUDGET

*** ALL ORGANIZATIONAL LEVELS ***

	SALARY RATE	FULL TIME EQUIVALENT	PERCENT	COSTS	PERCENT OF ORGANIZATIONAL BUDGET	PERCENT OF INSTRUCTIONAL BUDGET
CHAIRMAN	22,050	7.92		174,633	9.70	9.7014
FACULTY (BY RANK)						
(FP) PROFESSOR	17,627	19.27	22.79	339,675	18.87	18.8700
(AP) ASSOC. PROFESSOR	14,970	25.54	30.21	382,330	21.24	21.2346
(TP) ASST. PROFESSOR	11,733	25.12	29.71	294,739	16.37	16.3735
(IN) INSTRUCTOR	9,565	10.34	12.23	98,905	5.49	5.4945
(TA) TEACH ASSISTANT	6,854	4.27	5.05	29,268	1.63	1.6259
(**) FACULTY TOTALS	13,543	84.54	100.00	1,144,913	63.60	63.6035
STAFF (BY CATEGORY)						
(SS) SUPPORT STAFF	5,144	23.56	63.03	121,667	6.76	6.7590
(AD) ACADEMIC DEAN	15,209	13.82	36.97	210,184	11.68	11.6764
(**) STAFF TOTALS	8,878	37.38	100.00	331,851	18.44	18.4354
EXPENSES (BY TYPE)						
(SU) SUPPLIES				46,806	2.60	2.6002
(EQ) EQUIPMENT				41,445	2.30	2.3024
(MI) MISCELLANEOUS				19,511	1.08	1.0839
(**) EXPENSE TOTALS				107,762	5.99	5.9865
ADDITIONAL EXPENSES				40,919	2.27	2.2732
*** TOTALS ***		129.84		1,800,078	100.00	100.0000

COSTS BY COURSE LEVEL	COST	PER-CENT	HOURS PRODUCED	PER-CENT	PERCENT TOT HRS	UNIT COST	FTE FACULTY	PER-CENT	PRODUCT. RATIO
(LD) LOWER DIVISION	576,390	32.02	8,412	44.08	44.08	68.52	30.08	35.58	279.65
(UD) UPPER DIVISION	684,796	38.04	7,041	36.90	36.90	97.26	31.65	37.44	222.46
(GD) GRAD DIVISION	538,892	29.94	3,629	19.02	19.02	148.50	22.81	26.98	159.10
(**) CRSE LVL TOTALS	1,800,078	100.00	19,082	100.00	100.00	94.33	84.54	100.00	225.72

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Figure 3

RRPM 1.6 OUTPUT: INSTITUTIONAL SUMMARY

ITER = (00) DEFAULT DATA
BASE = (**)

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RESOURCE REQUIREMENTS PREDICTION MODEL

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INSTITUTIONAL SUMMARY — ACTIVITY COSTS

ACTIVITY NAME	ACTIVITY COST	ESTIMATING EQUATION COEFFICIENTS: CONSTANT	ENROLL.	FACULTY	STAFF	HOURS	FAC-& STAFF-& BUDGET
1.00 INSTRUCTION PGM							
1.10 GENERAL ACADEMIC	1,800,078	1,800,078					
1.40 EXTENSION INST.	95,663	82,303	10.00				
SUB-TOTAL	1,895,741						
2.00 ORGANIZED RSRCH							
2.10 INST.& RSRCH CTR	60,194	34,832		300.00			
2.20 IND/PROJ RSRCH	86,490	44,220		500.00			
SUB-TOTAL	146,684						
3.00 PUBLIC SERVICE							
3.10 CONTINUING EDUC.	12,967	12,122		10.00			
3.20 COMMUNITY SERV.	8,882	4,655		50.00			
SUB-TOTAL	21,849						
4.00 ACADEMIC SUPPORT							
4.10 LIBRARIES	233,794	74,832	100.00	300.00			
4.20 MUSEUM-GALLERY	34,914	28,015	2.00	50.00			
4.40 COMPUTING SUPP.	75,458	53,644	10.00	100.00			
SUB-TOTAL	344,166						
5.00 STUDENT SERVICE							
5.10 SOC-CUL DEVELOP.	440,250	264,380	100.00	500.00			
5.20 SUPPL. EDUC. SER	60,100	60,100					
5.30 COUNSELING/GUID.	47,560	47,560					
5.40 FINANCIAL AID	32,290	32,290					
5.50 STUDENT SUPP	795,910	666,310	100.00				
SUB-TOTAL	1,380,110						
6.00 INST. SUPPORT							
6.10 EXECUTIVE MGT.	168,878	147,064	10.00	100.00			
6.20 FINANCIAL OPER.	52,545	46,986	1.00	50.00			
6.30 GEN. ADMIN. SERV	244,222	207,712	21.00	100.00			
6.40 LOGISTICAL SERV.	103,615	85,559	10.00	55.55			
6.50 PHYS. PLANT OPER	283,809	271,428		100.03		.210	
6.70 COMMUNITY REL.	75,357	73,176	1.00	10.00			
SUB-TOTAL	928,510						

Figure 4

ICL[illegible]ENERATOR OUTPUTS

ICLM-05 INDUCED COURSE LOAD MATRIX SYSTEM PAGE 05
NCHENS (ICLM/IWLM

STUDENT LEVEL = (2) YEAR 2 INSTRUCTION (COURSE) LEVEL = (1) LOWER LVL ENROLLMENTS ARE HEADCOUNT

-- MAJOR --- / -- ENROL ---	(001) ASBA 1	ART	(002) ASBSC	CHEM	(003) BCOMM 2	ACCT	(004) BEC 2	EDUC	(005) GSMENGENEL 2
DEPT = 001 ACCOUNTING		3 3.00							
DEPT = 003 ART								4 2.00	
DEPT = 005 CHEMISTRY				4.50				3 2.50	
DEPT = 007 EDUC ADMIN					3 1.50				
DEPT = 009 EDUC C&I								6 3.00	
DEPT = 011 ENGINEER	3 3.00		4 4.00		6 3.00		6 3.00		4 2.00
DEPT = 013 MANAGE SCI									3 1.50
DEPT = 015 PHYSICS		3 3.00				6 3.00			3 1.50
** TOTAL **	9		10		15		21		10
** TOTAL **	9.00		10.00		7.50		10.50		5.00

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